PATENT

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Case Docket No. ASMEX.271A
Date: March 3, 2005
Page 1

In re application of	:	Michael W. Halpin
Appl. No.	:	09/828,550
Filed	:	April 6, 2001
For	:	BARRIER COATING FOR VITREOUS MATERIALS
Examiner	:	Rudy Zervigon
Art Unit	:	1763

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March 3, 2005
(Date)

Rabinder N. Narula, Reg. No. 53,371

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith in triplicate is an Appellants' Brief to the Board of Patent Appeals:

(X) Amendment in 5 pages.

(X) Fee for filing brief in the amount of $400 is enclosed.

(X) A check in the amount of $400 to cover the foregoing fees is enclosed.

(X) If applicant has not requested a sufficient extension of time and/or has not paid any other fee in a sufficient amount to prevent the abandonment of this application, please consider this as a Request for an Extension for the required time period and/or authorization to charge our Deposit Account No. 11-1410 for any fee which may be due. Please credit any overpayment to Deposit Account No. 11-1410.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appl. No.	:	09/828,550
Applicant	:	Michael W. Halpin
Filed	:	April 6, 2001
TC/A.U.	:	1763
Examiner	:	Rudy Zervigon
Title	:	BARRIER COATING FOR VITREOUS MATERIALS
Docket No.	:	ASMEX.271A
Customer No.	:	20,995

ON APPEAL TO THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPEAL BRIEF

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Sir:

The Appellant appeals the rejection of Claims 1-4, 6-10, 13, 14, 46-48 and 58-68 in the above-captioned patent application. These claims were rejected in a Final Office Action dated August 31, 2004.

This Appeal Brief is being filed in accordance with the rules of 37 C.F.R. § 41.37 and includes a Claims Appendix, an Evidence Appendix, and a Related Proceedings Appendix.

I. REAL PARTY IN INTEREST

The real party in interest is the assignee of record, ASM America, Inc.

II. RELATED APPEALS AND INTERFERENCES

The Appellant knows of no other appeals or interferences that will directly affect, be directly affected by, or have a bearing on the Board's decision in this Appeal.

III. STATUS OF CLAIMS

Claims 1-4, 6-10, 13, 14, 46-48 and 58-68, as listed the Claim Appendix, remain pending and are the subject of this Appeal. Claims 5, 11, 12, 15-45 and 49-57 have been cancelled.

On August 31, 2004, the Examiner finally rejected Claims 1-4, 6-10, 13, 14, 46-48 and 58-68.

In an Amendment Accompanying Appellant's Appeal Brief filed concurrently herewith, Appellant cancels Claims 15-45 and 49-57, which were previously withdrawn.

Prosecution History Of Claims Prior To August 31, 2004 Final Office Action

The above-captioned application was originally filed on April 6, 2001, with Claims 1–45.

On May 30, 2002, in a Preliminary Amendment, Applicant added Claims 46-54.

On October 29, 2002, when responding to a Restriction Requirement mailed on September 30, 2002, Applicant withdrew Claims 15-45 and 49-54.

On May 15, 2003, when responding to an Office Action mailed on January 15, 2003, Applicant canceled Claims 11 and 12, added Claims 55-65 and amended Claims 1, 6–10, 13, and 47.

On December 23, 2003, when concurrently filing an Amendment and a Request for Continued Examination in response to a Final Office Action mailed on July 25, 2003, Applicant amended Claim 1 and canceled Claim 5.

On May 17, 2004, when responding to an Office Action mailed on February 17, 2004, Applicant renumbered Claims 46-65 to Claims 49-68 per the Examiner's request.

On November 30, 2004, when responding to an Final Office Action mailed on August 31, 2004, Applicant canceled Claims 15-57, however, the Examiner did not enter this amendment.

IV. STATUS OF AMENDMENTS

As disclosed in Section III above, accompanying the present Appeal Brief, Appellant has filed an Amendment that cancels Claims 15-45 and 49-57. The Amendment is filed in accordance with 37 C.F.R. § 41.33(b)(1) and in an effort to reduce the number of issues on Appeal.

V. SUMMARY OF CLAIMED SUBJECT MATTER

A. Independent Claim 1

As recited in the Claim Appendix, Claim 1 reads as follows:

> A semiconductor processing apparatus comprising a reaction chamber and one or more vitreous components that have a support surface for supporting other components in the reaction chamber, said support surface being covered at least in part by a devitrification barrier coating that is bonded to said support surface and directly contacts said supported other components in the reaction chamber; where said devitrification barrier coating has a thickness between about 1 and 10,000 angstroms.

With reference to Figures 1-2, independent Claim 1 recites a semiconductor processing apparatus comprising a reaction chamber 10 that includes a support surface 24 for supporting other components in the reaction chamber 10. *See* page 10, lines 1–5. The support surface is covered, at least in part, by a devitrification barrier coating 40 that is bonded to the support surface and directly contacts the supported other components in the reaction chamber. *See* page 10, lines 4–6. The devitrification barrier coating 40 has a thickness between about 1 and 10,000 angstroms *See* page 9, line 3.

B. Independent Claim 58

As recited in the Claim Appendix, Claim 58 reads as follows:

> A semiconductor processing apparatus comprising a reaction chamber and a thermocouple, the thermocouple comprising a quartz sheath having an outer surface that is covered at least in part by a devitrification barrier coating having a thickness between about 1 and 10,000 angstroms.

With initial reference to Figures 1-2, independent Claim 58 recites a semiconductor processing apparatus comprising a reaction chamber 10 and a thermocouple 34. *See* page 8, lines 3–4. With reference to Figure 3, the thermocouple 34 comprising a quartz sheath 35. *See* page 8, lines 7-8 and 16-18. The quartz sheath 35 has an outer surface that is covered at least in part by a devitrification barrier

coating 40. *See* page 8, lines 22-24. The coating 40 has a thickness between about 1 and 10,000 angstroms. *See* page 9, line 3.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1-4, 6-9, 13, 14, 46, 47, and 58-65 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,342,891 to Johnsgard et al. ("the Johnsgard patent") in view of U.S. Patent No. 6,120,640 to Shih et al. ("the Shih patent").

2. Claims 1-4, 6-9, 10, 13, 14 and 47 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,325,858 to Wengert ("the Wengert patent") in view of the Shih patent.

VII. ARGUMENT

A. Rejection of Claims 1-4, 6-9, 13, 14, 46, 47, and 58-65 under 35 U.S.C. § 103(a) over the Johnsgard patent in view of the Shih patent.

Neither the Johnsgard patent nor the Shih patent, nor a combination thereof, teaches or suggests semiconductor apparatus with a support surface (Claim 1) or a thermocouple (Claim 58) having a devitrification barrier coating with a thickness between about 1 and 10,000 angstroms.

The Examiner has acknowledged that none of the references teach a devitrification barrier coating having a thickness of about 1 to 10,000 angstroms. *See e.g.,* the Office Action dated February 17, 2004, page 8, paragraph 9. Nevertheless, the Examiner has argued that it would be obvious to those of ordinary skill in the art to optimize the thickness of a silicon nitride devitrification barrier. *See e.g.,* the Office Action dated August 31, 2004, page 8. However, as explained below, there is no teaching or suggestion in the cited art to use silicon nitride as a devitrification barrier and, when silicon nitride is employed for other purposes, other thickness ranges are used. Moreover, before an optimum range can be characterized as a result of routine experimentation, a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves the recognized result. *See* MPEP § 2144.05. In this case, the cited art does not recognize the use of silicon nitride as a devitrification barrier coating on a support surface (independent Claim 1) or on a thermocouple (independent Claim 58). As such, there is no recognition in the cited art of the "recognized result" needed for one of ordinary skill in the art to optimize the thickness of a devitrification barrier coating as suggested by the Examiner.

The primary reference (the Johnsgard patent) does not disclose a devitrification barrier. Instead, the Johnsgard patent discloses using silicon nitride as a reflective layer on an insulating reactor wall. *See* Col. 17, lines 22-30. Specifically, the Johnsgard patent states that one alternative to glazed opaque quartz is to use insulating walls "formed from a transmissive material such as clear quartz [that have been] coated with a reflective material such as alumina, silicon carbide or silicon nitride." *Id.* However, no thickness is disclosed for this silicon nitride reflective layer.

The Johnsgard patent therefore does not teach or suggest the recited thickness and it does not provide any teaching or suggestion for using a silicon nitride coating as a devitrification barrier.

In a similar manner, the Shih patent discloses an erosion resistant barrier of silicon nitride as an alternative to B_4C. However, no thickness is disclosed for this silicon nitride barrier and the disclosed thickness of the B_4C barrier (approximately 1,250,000 angstrom) is significantly larger than the claimed range of 1 to 10,000 angstroms. *See* Col. 9, lines 19-25 and Col. 10, lines 50-65. In addition, the erosion resistant barrier is for walls made of aluminum, aluminum based materials, stainless steels and other steels. *See* Col. 11, 45-55. The thickness of the barrier is determined by the erosion rates in the reactor. *See* Col. 5, lines 30-34. Accordingly, the Shih patent would merely suggest to one of skill in the art a relatively thick erosion barrier over metallic walls. As taught by the Shih patent, the thickness of this coating would be determined by the erosion rates of the reactor. Importantly, there is no teaching or suggestion to use a silicon nitride coating as a devitrification barrier nor is there any teaching of a protective layer in the recited thickness range.

Nevertheless, the Examiner stated that it would have been obvious to modify the silicon nitride barrier of the Shih patent to achieve the claimed thickness because "it is well established that thermal isolation of any material, including CVD equipment, depends on both the thermal conductivity of the protective coating and the thickness of the protective coating per Fourier's law." *See e.g.,* the Office Action dated August 31, 2004, page 8. However, the claimed barrier is not a thermal barrier but a devitrification barrier with a specific thickness range configured to prevent devitrification. As such, while Fourier's law may guide one of ordinary skill in the art in selecting the thickness of a thermal barrier, it does not make obvious the recited thickness of a devitrification barrier coating. That is, Fourier's law does not relate devitrification to the thickness of the coating, and therefore Fourier's law does not teach or suggest the recited thickness.

In summary, there is no motivation in the cited art to optimize the thickness of a silicon carbide coating for use as a devitrification barrier. Instead, the Shih patent discloses an erosion barrier of unspecified thickness and the Johnsgard patent discloses a reflective layer of unspecified thickness. Therefore, the cited art does not

disclose the "recognized result" needed for one of ordinary skill in the art to optimize the recited thickness, which Applicant has determined is useful as a devitrification barrier coating. The Examiner relies heavily on Fourier's law. However, Fourier's provides no showing that a coating of silicon nitride within the recited thickness of about 1 to 10,000 angstroms would be good for thermal isolation.

B. Rejection of Claims 1-4, 6-9, 13, 14, and 47 under 35 U.S.C. § 103(a) over the Wengert patent in view of the Shih patent.

Neither the Wengert patent nor the Shih patent, nor a combination thereof, teaches or suggests semiconductor apparatus with a support surface having a devitrification barrier coating with a thickness between about 1 and 10,000 angstroms.

As noted above in Section A, the Examiner has acknowledged that none of the references teach a devitrification barrier coating having a thickness of about 1 to 10,000 angstroms. Nevertheless, the Examiner has argued that it would be obvious to those of ordinary skill in the art to optimize the thickness of the silicon nitride devitrification barrier. However, as explained herein, there is no teaching or suggestion in the cited art to use silicon nitride as a devitrification barrier and, when silicon nitride is employed for other purposes, other thickness ranges are used.

With respect to the Wengert patent, this reference discloses coating a non-vitreous material (e.g., graphite) with silicon carbide. *See* Col. 1, lines 30-35. The Wengert also discloses a separate component or sheath (considerably thicker than the recited coating) that fits over a corresponding quartz component. *See* Col. 7, lines 5-10. Therefore, the Wengert patent also does not provide any teaching or suggestion for using a silicon nitride coating as a devitrification barrier, and therefore does not teach or suggest the recited thickness.

The Shih patent has been discussed above and does not cure the deficiency in the Wengert patent.

C. Conclusion

In view of the foregoing arguments distinguishing Claims 1, 4–7 and 15–20 over the art of record, Appellant respectfully requests that the rejection of these claims be reversed.

Please charge any additional fees, including any fees for additional extensions of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 3-3-05

By: _____

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CLAIMS APPENDIX

1. A semiconductor processing apparatus comprising a reaction chamber and one or more vitreous components that have a support surface for supporting other components in the reaction chamber, said support surface being covered at least in part by a devitrification barrier coating that is bonded to said support surface and directly contacts said supported other components in the reaction chamber; where said devitrification barrier coating has a thickness between about 1 and 10,000 angstroms.

2. The apparatus of Claim 1, wherein said one or more vitreous components are formed from quartz.

3. The apparatus of Claim 1, wherein said devitrification barrier comprises silicon nitride.

4. The apparatus of Claim 1, wherein said devitrification barrier coating is formed from silicon nitride that has been deposited on said one or more vitreous components using CVD deposition.

5. (Canceled)

6. The apparatus of Claim 1, where said devitrification barrier coating has a thickness between about 50 and 5000 angstroms.

7. apparatus of Claim 6, where said devitrification barrier coating has a thickness between about 500 and 3,000 angstroms.

8. The apparatus of Claim 7, where said devitrification barrier coating has a thickness of about 800 angstroms.

9. The apparatus of Claim 1, where said devitrification barrier coating is selected from the group consisting of silicon nitride, diamond, titanium nitride, titanium carbon nitride, and combinations thereof.

10. The apparatus of Claim 1, wherein said devitrification barrier coating covers an entire portion of said support surface of said one or more vitreous components.

11. (Canceled)

12. (Canceled)

13. The apparatus of Claim 1, wherein said apparatus further comprises a support device comprising at least one laterally extending member, said radially extending member including an upwardly extending projection that defines said support surface, said projection and support device configured to support a substrate within said apparatus, said support surface of said projection being covered at least in part by said devitrification barrier coating.

14. The apparatus of Claim 1, wherein said reaction chamber is a chemical vapor deposition reaction chamber.

15-45. (Canceled)

46 The apparatus as in Claim 1, wherein said devitrification barrier coating is formed from silicon nitride that has been deposited on said one or more vitreous components using sputtering.

47. The apparatus of Claim 1, wherein said devitrification barrier coating is formed by CVD.

48. The apparatus of Claim 1, wherein said devitrification barrier coating is formed by sputtering.

49-57. (Canceled)

58. A semiconductor processing apparatus comprising a reaction chamber and a thermocouple, the thermocouple comprising a quartz sheath having an outer surface that is covered at least in part by a devitrification barrier coating having a thickness between about 1 and 10,000 angstroms.

59. The apparatus of Claim 55, wherein said devitrification barrier comprises silicon nitride.

60. The apparatus of Claim 55, wherein said devitrification barrier coating is formed from silicon nitride that has been deposited on said thermocouple using CVD deposition.

61. The apparatus of Claim 58, where said devitrification barrier coating has a thickness between about 50 and 5,000 angstroms.

62. The apparatus of Claim 59, where said devitrification barrier coating has a thickness between about 500 and 3,000 angstroms.

63. The apparatus of Claim 60, where said devitrification barrier coating has a thickness of about 800 angstroms.

64. The apparatus of Claim 55, where said devitrification barrier coating is selected from the group consisting of silicon nitride, diamond, titanium nitride, titanium carbon nitride, and combinations thereof.

65. The apparatus of Claim 55, wherein said devitrification barrier coating only covers a portion of said quartz sheath that is most susceptible to devitrification.

66. The apparatus as in Claim 55, wherein said devitrification barrier coating is formed from silicon nitride that has been deposited on said thermocouple using sputtering.

67. The apparatus of Claim 55, wherein said devitrification barrier coating is formed by CVD.

68. The apparatus of Claim 55, wherein said devitrification barrier coating is formed by sputtering.

EVIDENCE APPENDIX

[NONE]

RELATED PROCEEDINGS APPENDIX

[NONE]

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